

**CLAIMS**

1. A polyfunctional sub-assembly ensuring contact, material distribution and heat and/or material exchange of at least one gas phase, at least a portion of which is hydrogen, and at least one liquid phase, for a vessel containing at least one bed of granular solid, said phases being in overall downflow mode and traversing said bed of granular solid, said sub-assembly comprising at least one distributor tray (P) located above the bed of granular solid, comprising a plurality of downcomers (1) each surmounted by at least one jet disturber device and each having in its upper portion at least one cross section of flow (22) for entry of the major portion of said gas phase into said downcomer and, between said upper portion and the lower portion of said downcomer above tray (P), at least one cross section of flow (2) for entry of the major portion of said liquid phase into said downcomer, and in its lower portion at least one cross section of flow (23) for the two-phase or poly-phase mixture formed in said downcomer for distributing it over the bed of granular solid located below said lower portion, the sub-assembly being characterized in that each downcomer contains at least one packing between its upper portion and its lower portion constituted by at least one element the cross section for flow of which is essentially transverse to the downcomer axis, said element extending across the whole of the transverse cross section of the downcomer in the circulation zone and being constituted by cells through which said liquid and said gas phase pass, said cells orientating the circulation of fluids inside said downcomer in a substantially radial direction..
2. A sub-assembly according to claim 1, comprising at least one means for dispersing the two-phase or poly-phase mixture formed in said downcomer located close to the cross section of flow (23) of the lower portion of each downcomer.
3. A sub-assembly according to claim 2, in which each downcomer contains at least two non contiguous packings, the last packing, located close to the cross section of flow (23) of the lower portion of each downcomer, carrying out said function of dispersing the two-phase or poly-phase mixture formed in said downcomer.
4. A sub-assembly according to claim 3, in which the last packing, located close to the cross section of flow (23) of the lower portion of each downcomer carrying out said function of

dispersing the two-phase or poly-phase mixture formed in said downcomer, comprises a portion that is internal to the downcomer and a portion that is external to said downcomer.

5. A sub-assembly according to claim 2, in which the means carrying out the dispersion of the two-phase or poly-phase mixture formed in the downcomer is an jet disturber device with a controlled porosity located below and close to the cross section of flow (23) of the lower portion of said downcomer
6. A sub-assembly according to any one of claims 1 to 5, in which the downcomer comprises at least two cross sections of flow (2) of the liquid phase located at different levels above the distributor tray (P) and below the cross section of flow (22) closest to said distributor tray (P).
7. A sub-assembly according to any one of claims 1 to 6, in which the cross sections of flow of the liquid phase are apertures of any shape and/or slots.
8. A sub-assembly according to any one of claims 1 to 7, in which the cross section of flow (2) of the liquid phase closest to the distributor tray (P) is located at a sufficient distance from said tray (P) for a level of liquid to be established above said tray (P).
9. A sub-assembly according to any one of claims 1 to 8, in which the downcomer comprises a portion above the distributor tray (P) and a portion below the distributor tray (P)
10. A vessel comprising close to its upper end an inlet for a first liquid fluid and for a second gaseous fluid, containing at least one bed of granular solid there being mounted above said bed a sub-assembly according to any one of claims 1 to 9, characterized in that above said sub-assembly, said vessel comprises at least one side inlet for a third fluid, preferably a gas, which may be identical to or different from said first or second fluid.
11. A vessel according to claim 10, in which said third fluid is a fluid for heat exchange and/or material exchange with at least one of said first or second fluids
12. A vessel according to claim 10 or claim 11, for carrying out a catalytic reaction in which the bed (or beds) of granular solid is a catalyst bed.
13. A vessel according to any one of claims 10 to 14 for carrying out a catalytic reaction in which one of the reactants is hydrogen.

# PATENT

## INSTITUT FRANÇAIS DU PÉTROLE

### POLYFUNCTIONAL SUB-ASSEMBLY FOR CONTACT, MATERIAL DISTRIBUTION AND HEAT AND/OR MATERIAL EXCHANGE OF AT LEAST ONE GAS PHASE AND AT LEAST ONE LIQUID PHASE

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#### ABSTRACT

A sub-assembly is described that ensures contact, material distribution and heat and/or material exchange of at least one gas phase, at least a portion of which is hydrogen, and at least one liquid phase, for a vessel containing at least one bed of granular solid, said phases being in overall downflow mode and traversing said bed of granular solid, said sub-assembly comprising at least one distributor tray (P) located above the bed of granular solid, comprising a plurality of downcomers (1) each surmounted by at least one jet disturber device and each having in its upper portion at least one cross section of flow (22) for entry of the major portion of said gas phase into said downcomer and, between said upper portion and the lower portion of said downcomer above tray (P), at least one cross section of flow (2) for entry of the major portion of said liquid phase into said downcomer, and in its lower portion at least one cross section of flow (23) of the mixture formed in the downcomer for distributing it over the bed of granular solid located below said lower portion, each downcomer containing at least one packing extending across the whole of the transverse cross section of the downcomer between its upper portion and its lower portion in the circulation zone, constituted by cells through which said liquid and said gas phase pass, said cells orientating the circulation of fluids inside said downcomer in a substantially radial direction.

Figure 2 to be published.

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